

MILITARY SPECIFICATION

CAP, FUEL TANK: FOR MILITARY COMBAT AND TACTICAL TRANSPORT VEHICLES

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers three types of fuel tank caps intended for use on military vehicles. The type I and type XI fuel tank caps are vented, while the type III fuel tank cap is nonvented (see 6.1).

1.2 Classification. Fuel tank caps, hereinafter referred to as "caps", shall be of the following types, as specified (see 6.2):

Type I	Vented cap with pressure relief valve and float assembly (MS51300).
Type II	Vented cap with pressure relief valve and fording valve (MS35645).
Type III	Nonvented cap (MS3507S).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DOT)ISS) and supplement thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Tank-Automotive Command, ATTN: AMSTA-GDS, Warren, MI 48397-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A

FSC 2910

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SPECIFICATIONS

FEDERAL

- | | |
|-----------|--|
| PPP-B-566 | - Boxes, Folding, Paperboard. |
| PPP-B-601 | - Boxes, Wood, Cleated-Plywood. |
| PPP-B-621 | - Boxes, Wood, Nailed and Lock-Corner. |
| PPP-B-636 | - Boxes, Shipping Fiberboard |
| PPP-B-640 | - Boxes, Fiberboard, Corrugated, Triple-Wall. |
| PPP-B-665 | - Boxes, Paperboard, Metal Edged and Components. |
| PPP-B-676 | - Boxes, Setup. |

MILITARY

- | | |
|-----------|--|
| MIL-P-116 | - Preservation, Methods of. |
| MIL-B-117 | - Bags, Sleeves and Tubing-Interior Packaging. |

STANDARDS

MILITARY

- | | |
|---------------|--|
| MIL-STD-105 | - Sampling Procedures and Tables for Inspection by Attributes. |
| MIL-STD-129 | - Marking for Shipment and Storage. |
| MIL-STD-130 | - Identification Marking of US Military Property. |
| MIL-STD-45662 | - Calibration Systems Requirements. |
| MS35644 | - Filler Neck Assembly, Fuel Tank - Military Vehicles. |
| MS35645 | - Cap, Fuel Tank: Tactical Vehicles, Fording. |
| MS51300 | - Cap, Fuel Tank: Combat Vehicle, Spill Proof . |
| MS53075 | - Cap, Fuel Tank: Tactical Vehicle, Non-Vented. |

(Copies of specifications and standards required by the contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D3951

- Commercial Packaging, Practice for.

(Application for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA, 19103.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this 'specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. Unless otherwise specified (see 6.2), the contractor shall furnish caps, of the specified type (see 6.2), which shall be subjected to first article inspection (see 4.4). First article inspection samples, properly marked with identifying information shall be representative of the caps co 'be furnished to the Government. All subsequent caps delivered to the Government shall conform to these samples in all of their pertinent physical and performance attributes.

3.2 Materials (all types). Materials shall be as specified herein and in referenced specifications, standards and drawings. Materials shall be free of defects which adversely affect performance or serviceability of the finished product (see 4.6.1).

3.2.1 Recycled, virgin and reclaimed materials. There are no requirements for the exclusive use of virgin materials. The use of recycled or reclaimed (recovered) materials is acceptable provided that all other requirements of this specification are met (see 6.3.1).

3.3 Construction (all types) (see 4.6.1 and 4.6.2).

3.3.1 Type I. Type I caps shall conform to MS51300.

3.3.2 Type II. Type II caps shall conform to MS35645.

3.3.3 Type III. Type III caps shall conform to MS53075.

3.4 Performance.

3.4.1 Torque.

3.4.1.1 Caps (all types). When connecting the cap to a filler neck conforming to MS35644 at temperatures of plus 125 to minus 65 degrees Fahrenheit (°F), the torque shall be no greater than 70 inch-pounds attained before the cap hits the stop limit. The torque required to disconnect the cap from the filler neck at temperatures of plus 125 to minus 65°F shall be not greater than 70 nor less than 25 inch-pounds. There shall be no visible evidence of binding (see 4.6.3.1).

3.4.1.2 Fording valve (type 11 only). The torque required to move the fording valve out of closed or open position shall be not less than 10 inch-ounces (see 4.6.3.2).

3.4.2 Leakage (all types). When tested as specified in 4.6.4, with a pressure of 2 pounds per square inch (psi) for type I and 1 psi for type II (with fording valve closed) and type III caps, the leakage shall not exceed 0.5 ounce per minute.

3.4.3 Pressure relief valve opening.

3.4.3.1 Type I. When tested as specified in 4.6.5.1, the pressure relief valve for type I caps shall open at between 4 to 5 psi, when the float is in the actuated condition.

3.4.3.2 Type II. When tested as specified in 4.6.5.2, the pressure relief valve for type II caps shall open at between 2 to 3 psi, when the fording valve is in the closed position.

3.4.4 Free breathing (types I and II). When tested as specified in 4.6.6, type I and type 11 caps (type II cap with fording valve open) shall have an air flow through them of not less than 0.010 cubic foot per minute (cfm), at room temperature with 1 psi vacuum.

3.4.5 Shear strength (all types). When tested as specified in 4.6.7, type I caps shall withstand not less than 25 foot-pounds of applied torque before showing any rotation of the inner member with respect to the outer shell. Type II and type 111 caps shall withstand not less than 25 foot-pounds of applied torque before showing any rotation of cup on inner plate or inner plate on shell.

3.4.6 External pressure (types II and 111). When tested as specified in 4.6.8, type 11 (with fording valves closed) and type III caps shall not leak.

3.5 Finish (all types). Unless otherwise specified (see 6.2), caps shall be finished on the interior or exterior as specified in the applicable MS standard (see 3.3 and 4.6.2).

3.6 Identification marking (all types). Caps shall be marked in accordance with the applicable MS standard and the requirements of MIL-STD-130 (see 3.3 and 4.6.2).

3.7 Workmanship (all types). The workmanship of the cap shall be of such quality as to assure a product free of defects affecting its serviceability and appearance (see 4.6.2).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform or witness any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Inspection equipment. Unless otherwise specified in the contract (see 6.2), the contractor is responsible for the provision and maintenance of all inspection equipment necessary to assure that supplies and services conform to contract requirements. Inspection equipment must be capable of repetitive measurements to an accuracy of 10 percent (%) of the measurement tolerance. Calibration of inspection equipment shall be in accordance with MIL-STD-45662.

4.2 Classification of inspection:

- a. First article inspection (see 4.4).
- b. Quality conformance inspections (see 4.5).
 1. Examination (see 4.5.2).
 2. Tests (see 4.5.3).
- c. Inspection of packaging (see 4.7).

4.3 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be conducted under the following conditions:

- a. Air temperature $73 \pm 18^{\circ}\text{F}$
- b. Barometric pressure 28.5 ± 2 inches mercury (Hg)
- 3
- c. Relative humidity $50 \pm 30\%$

4.3.1 Cleaning. The caps and all cap parts in contact with fuel shall be cleaned prior to tests.

4.3.2 Filler neck. When the use of a filler neck is specified during testing, the filler neck shall conform to MS35644.

4.4 First article inspection. Unless otherwise specified (see 6.2), the Government shall select five sample caps, of the specified type, produced under the production contract for first article inspection. First article samples shall be inspected as specified in table I. Approval of the first article sample by the Government shall not relieve the contractor of his obligation to supply caps that are fully representative of those inspected as a first article sample. Any changes or deviation of the production units from the first article sample shall be subject to the approval of the contracting officer. The applicability of cap types to tests shall be as specified in table II.

TABLE X. Classification of inspections.

Title	Requirement	Inspection	First article 1/	Quality conformance	
				Examination	Tests 1/
Materials and construction	3.2 and 3.3	4.6.1	X		
Defects (see table III)	3.3, 3.5 thru 3.7	4.6.2	X	X	
Torque, cap	3.4.1.1	4.6.3.1	X		X
Torque, fording valve	3.4.1.2	4.6.3.2	X		X
Leakage	3.4.2	4.6.4	X		X
Pressure relief valve opening	3.4.3	4.6.5	X		X
Free breathing	3.4.4	4.6.6	X		X
Shear strength	3.4.5	4.6.7	X		X
External pressure	3.4.6	4.6.8	X		X
Packaging	5.1	4.7			

1/ See table II.

TABLE II. Applicability of cap types to tests.

Tests	Cap type		
	I	II	III
4.6.3.1	X	X	X
4.6.3.2		X	
4.6.4	X	X	X
4.6.5.1	X		
4.6.5.2		X	
4.6.6	X	X	
4.6.7	X	X	X
4.6.8		X	X

4.4.1 First article inspection failure. Deficiencies found during, or as a result of, first article inspection shall be cause for rejection of the first article samples until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during, or as a result of, first article inspection, shall be evidence that all items already produced prior to completion of first article inspection are similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. Such deficiencies on all items shall be corrected by the contractor. The Government shall not accept products until first article inspection is completed to the satisfaction of the Government.

4.5 Quality conformance inspection

4.5.1 Sampling.

4.5.1.1 Lot formation. An inspection lot shall consist of all the caps of one type and part number, from an identifiable production periods from one manufacturer, submitted at one time for acceptance.

4.5.1.2 Sampling for examination. Samples for quality conformance examination shall be selected in accordance with general inspection level II of MIL-STD-105.

4.5.1.3 Sampling for tests. Samples for quality conformance tests shall be selected in accordance with level S-3 of MIL-STD-105.

4.5.2 Examination.

4.5.2.1 Acceptable quality level. Each sample selected in accordance with 4.5.1.2 shall be examined to determine conformance to the following acceptable quality levels (AQL):

<u>Classification</u>	AQL
Major	1.0
Minor	2.5

4.5.2.2 Classification of defects. For examination purposes, defects shall be classified as listed in table III.

TABLE III. Classification of defects.

Category	Defect	Method of examination
Critical	None	
<u>Major</u>	<u>AQL 1.0% Defective</u>	
101	Dimensions, out of tolerance affecting interchangeability (see 3.3).	SIE <u>1/</u>
102	Faulty workmanship affecting performance (see 3.7).	Visual
<u>Minor</u>	<u>AQL 2.5% Defective</u>	
201	Dimensions, out of tolerance not affecting interchangeability (see 3.3).	SIE
202	Finish, improper (see 3.5).	Visual
203	Identification marking, improper (see 3.6).	Visual
204	Faulty workmanship affecting appearance (see 3.7).	Visual

1/ SIE = Standard Inspection Equipment.

4.5.3 Tests. Sample caps selected as specified in 4.5.1.3 shall be subjected to the quality conformance tests specified in table I, using an AQL of 6.5 on the basis of percent defective. The applicability of cap types to tests shall be as specified in table 11.

4.6 Methods of inspection.

4.6.1 Materials and construction (all types). Conformance to 3.2 and 3.3, shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.6.2 Defects (all types). Conformance to 3.3, 3.5, 3.6 and 3.7 shall be determined by examination for the defects listed in table III. Examination shall be visual or by measurement with standard inspection equipment.

4.6.3 Torque.

4.6.3.1 Caps (all types). To determine conformance to 3.4.1.1, the cap shall be connected to and then disconnected from the filler neck using a torque wrench. This procedure shall be repeated five times, observing the torque required. In connecting the cap, the maximum torque value shall be attained before the cap reaches the end of travel.

4.6.3.2 Fording valve (type II only). To determine conformance to 3.4.1.2, actuate the fording valve control from the "open" to the "closed" position and from the "closed" to the "open" position, using a torque wrench and noting the torque required.

4.6.4 Leakage (all types). To determine conformance to 3.4.2, a filler neck, with cap mounted, shall be placed in an airtight chamber (see figure 1). The chamber shall be 3/4 filled with a liquid of the viscosity of gasoline. It shall be rotated to place the cap below the liquid level. An internal pressure of 2 psi shall be applied for type I and 1 psi for types II and III caps and any leakage shall be recorded.

4.6.5 Pressure relief valve opening.

4.6.5.1 Type 1. To determine conformance to 3.4.3.1, fabricate an air pressure chamber from a MS35644 filler neck assembly. Gradually increase the air pressure to verify that the relief valve opens at 4 to 5 psig. The vent opening may be plugged with a rubber stopper. For safety reasons, the air supply system should be designed to preclude exceeding 10 psig. Since the effective area of the relief valve is approximately 1 square inch, an equivalent mechanical force may be used in lieu of air pressure. Visually observe the relief valve opening with a 4 to 5 lb force applied to the ball chamber by a suitable means, such as a spring scale.

4.6.5.2 Type II. To determine conformance to 3.4.3.2, the cap shall be placed on a filler neck and the fording valve shall be closed. Internal pressure of the filler neck shall be increased at a rate not exceeding 0.1 psi per second until pressure relief valve opens at a maximum of 6 psi is obtained.

4.6.6 Free breathing (types I and II). To determine conformance to 3.4.4, the cap shall be installed on a filler neck that is mounted on testing apparatus conforming to figure 2. One psi of vacuum shall be applied and the air flow meter shall be checked for resulting air flow through the cap.

4.6.7 Shear strength (all types). To determine conformance to 3.4.5, the cap shall be mounted on a filler neck. Torque shall be applied with a torque wrench until the rotation of the inner member of the type I cap with respect to its outer shell and until rotation of cup on inner plate or inner plate on shell for type II and type III caps occur* The value of torque in foot-pounds shall be recorded.

4.6.8 External pressure (types I and II). To determine conformance to 3.4.6, the cap shall be mounted on a filler neck. The assembly shall be inverted and placed in an airtight container (see figure 1) filled 3/4 full of water. The cap shall be below the water surface and the filler neck shall be vented to atmospheric pressure. A pressure of 5 psi shall be applied to the airtight container and maintained for 60 to 70 seconds after which the assembly shall be disassembled and inspected for leakage.

4.7 Inspection of packaging.

4.7.1 Army. Packaging shall be inspected as specified in the packaging requirement (see 5.1).

4.7.2 Navy and Air Force. The Government shall at unscheduled intervals inspect the packaging to determine conformance to the requirements of 5.2. Any evidence of deviation from specified requirements shall be cause for refusal to conduct further inspection until objective evidence has been provided by the contractor that corrective action has been taken.

5. PACKAGING

5.1 Preservation, packaging, packing, and marking (for Army use). Preservation, packaging, packing, and marking for the desired level shall be in accordance with the applicable packaging requirements specified by the contracting authority (see 4.7.1 and 6.2).

5.2 Preservation, packaging, packing, and marking (for Navy and Air Force use) (see 4.7.2).

5.2.1 Preservation and packaging. Preservation and packaging shall be level A, or commercial, as specified (see 6.2).

5.2.1.1 Level A.

5.2.1.1.1 Cleaning. Each cap shall be cleaned by any applicable process or combination of processes in accordance with MIL-P-116.

5.2.1.1.2 Drying. Immediately after cleaning, each cap shall be dried by any applicable procedure in accordance with MIL-P-116.

5.2.1.1.3 Unit packaging. Each cap shall be packaged in accordance with IC-2 of MIL-P-116, except a contact preservative is not required. Each cap shall be placed in a snug-fitting box conforming to the requirements of PPP-B-566, PPP-B-665, or PPP-B-676 and the box shall be enclosed in a heat-sealed bag conforming to class b of MIL-B-117.

5.2.1.1.4 Intermediate packaging. The packaged caps shall be packaged in an intermediate container conforming to PPP-B-636, type CF, class-domestic, variety DW and shall not exceed 20 pounds gross weight and 1.5 cubic feet in size. Intermediate container quantities shall be in multiples of 5 or 10.

5.2.1.2 Commercial. Cleaning, drying, preservation and packaging shall be in accordance with ASTM D3951.

5.2.2 Packing. Packing shall be level A, B or commercial, as specified (see 6.2).

5.2.2.1 Level A. The packaged caps shall be packed in overseas-type containers conforming to PPP-B-621 or PPP-B-601. The gross weight shall not exceed the weight limitation specified in the applicable container specification. The containers shall be closed in accordance with the applicable container specification or appendix thereto. Strapping shall be zinc coated.

5.2.2.2 Level B. The packaged caps shall be packed in domestic-type containers conforming to PPP-B-621, or PPP-B-601, or PPP-B-640 or PPP-B-636. The gross weight shall not exceed the weight limitations specified in the applicable container specification. The container shall be closed and strapped in accordance with the applicable container specification or appendix thereto.

5.2.2.3 Commercial. Packing shall be in accordance with ASTM D3951.

5.2.3 Marking. Marking shall be level A, B or commercial, as specified (see 6.2).

5.2.3.1 Levels A and B. Marking for levels A and B shall be in accordance with MIL-STD-129 and any special marking specified in the acquisition document (see 6.2).

5.2.3.2 Commercial. Marking shall be in accordance with ASTM D3951.

6. NOTES

6.1 Intended use. Caps covered by this specification are used on the following vehicles.

6.1.1 Type I. The cap is used on military tactical vehicles which are not used in fording operations.

6.1.2 Type II. The cap is used on military tactical vehicles with fuel supply systems designed for atmospheric venting through the fuel cap (fording valve open) and fuel systems incorporating a vacuum relief valve or combination vacuum and pressure relief valve (fording valve closed).

6.1.3 Type III. The cap is used on military combat and tactical vehicles with fuel supply systems designed for atmospheric venting by way of the engine air induction system or direct-to-atmospheric above the water line on fording.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type of cap required (see 1.2).
- c. If first article inspection is not required (see 3.1).
- d. If cap finish shall be other than as specified (see 3.5).
- e. If responsibility for inspection shall be other than as specified (see 4.1).
- f. If responsibility for inspection equipment shall be other than as specified (see 4.1.2).
- g. If inspection conditions shall be other than as specified (see 4.3).
- h. If first article inspection sample size shall be other than as specified (see 4.4).
- i. For Army use specify the applicable level and packaging standard requirements (see 5.1).
- j. For Navy and Air Force use specify commercial or applicable level of preservation, packaging, packing and marking (see 5.2.1, 5.2.2 and 5.2.3).
- k. Whether special marking is required (see 5.2.3.1).

6.3 Definitions.

6.3.1 Recovered materials. "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.3.2).

5.3.2 Solid waste. "Solid waste" means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, (33 U.S.C. 1342 et seq.) or source nuclear, or byproduct material as defined by the atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) (Source: Federal Acquisition Regulations, section 23.402).

6.4 Subject term (key word) listing.

Fuel tank cap
Tank, fuel cap

6.5 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

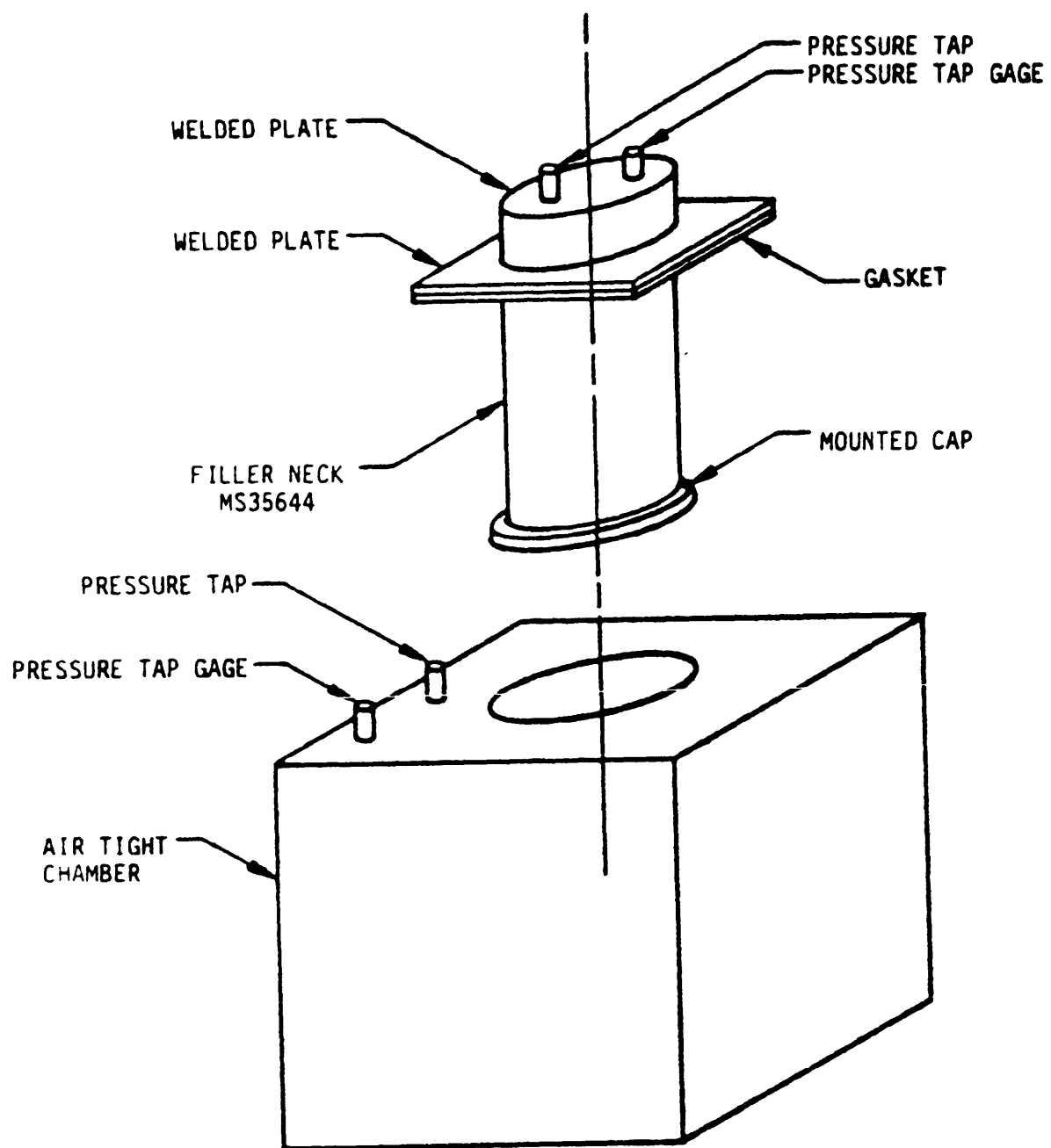


FIGURE 1. Schematic diagram of air tight chamber and modified filler neck.

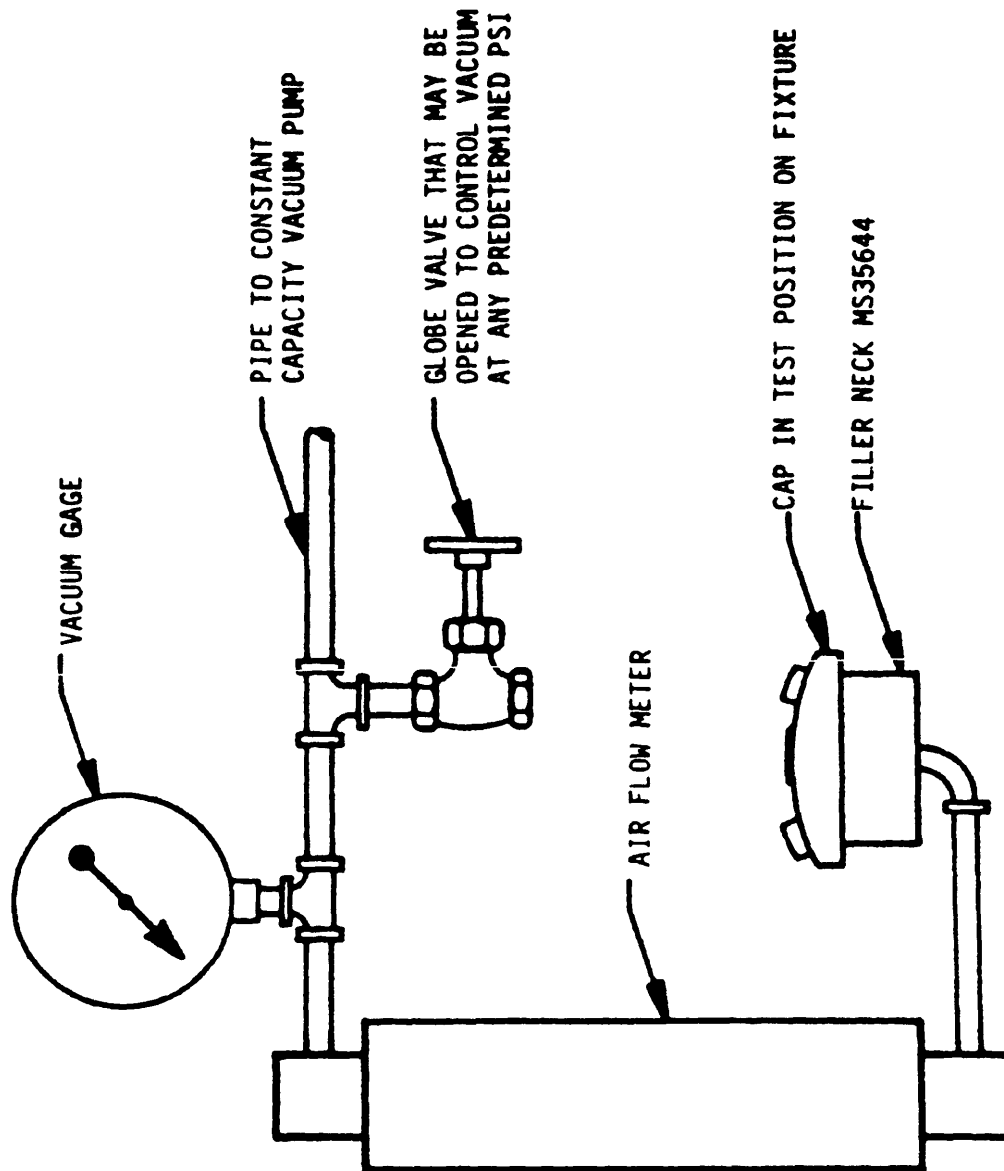


FIGURE 2. Set up for determining air flow through the type II cap.

Custodians:

Army - AT
Navy - MC
Air Force - 99

Preparing activity:

Army - AT

(Project 2910-0192)

Review activities:

Army - MI, GL
DLA - CS

User activity:

Navy - YD

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